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TAX ASYMMETRIES AND CAPITAL STRUCTURE CHOICES IN CLOSELY HELD FIRMS*

by

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Abstract

This paper presents a tax-based model of an entrepreneurial firm's capital structure choice problem, exposing the relevance of non-transferable tax deductions, "at risk" loss limitation, and related asymmetries in entrepreneurs' and investors' ability to exploit tax shields. While naive application of tax-based corporate capital structure theories implies all-equity financing of a closely-held enterprise, this analysis finds circumstances under which debt financing can be optimal.

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I. INTRODUCTION

Tax-based theories of corporate capital structure choices comprise an extensive literature in finance (e.g., Modigliani and Miller [7], Miller [5], DeAngelo and Masulis [1], Ross [10], Mayer [4]). Central to all of these theories are two phenomena: (1) double taxation of corporate equity earnings, which tends to favor debt, and (2) deferral and deduction opportunities available to shield equity earnings from both corporate and personal taxes, considerations which tend to favor equity financing. These tradeoffs have been shown to yield internal capital structure optima (e.g., DeAngelo and Masulis [1], Mayer [4]). However, these arguments do not apply to noncorporate organizations for which equity earnings, like debt payments, are taxed only once, at the personal level. For these firms, naive application of corporate capital structure theory suggests that tax considerations always favor equity; to the extent that equity earnings can be deferred or shielded at all, the relevant personal tax rate on these payouts will be lower than for debt. But this naive extension overlooks important features of the entrepreneurial firm's capital structure choice problem. This paper aims to expose these features and their relevance to tax-based capital structure issues.

More specifically, an entrepreneur is endowed with an on-going firm and an investment project requiring external finance. A variety of tax asymmetries imply that the method of finance will affect the value of the firm and, given competitive capital markets, the value of the entrepreneur's residual stake in the firm. On one hand, the entrepreneur, unlike a corporate equity holder, has a set of nontransferable tax deductions associated with the original firm, including tax loss carryforwards; different financial instruments will lead to different opportunities to exploit these deductions. On the other hand, the firm also has a set of deductions and credits which can be transferred to investors via equity financing. This transfer will be desirable if it increases the value of the relevant tax shields. Central to this valuation are the different tax characteristics of one equity holder, the entrepreneur, and other possible equity holders, the investors. This asymmetry among different equity holders is anathema to related analyses of a corporate firm in which stock holders are homogeneous (at the margin). Here, specific tax characteristics relevant to the valuation of transferable shields, and, thus, to capital structure choices, include: (1) marginal tax rates, (2) the availability of other income to offset tax losses, and (3) the extent to which a statutory "at risk" limitation on tax losses binds. The latter limitation prevents a security-holder form taking a tax loss greater than his investment "at risk." While the first two asymmetries often favor the investor's use of firm tax shields, the importance of the third asymmetry has not, to my knowledge, been appreciated in the literature. For a variety of reasons an entrepreneur may be less bound by the "at risk" limitation than the investor. For example, the entrepreneur can offset his share of losses against other royalties or salary paid to him by the firm. In addition, the entrepreneur may be in a better position to funnel other income through the firm, thereby exploiting losses which would otherwise be lost to the "at risk" limitation.

A priori, the relevance of nontransferable deductions and the "at risk" limits makes the capital structure problem nontrivial. The following analysis will show that the former consideration favors equity financing, while the latter can lead to use of debt instruments.

But before proceeding, the objective of this paper should be put in perspective. Entrepreneurial firms' capital structure choices are no doubt affected by nontax considerations, including those of risk-sharing, agency problems (e.g., Jensen and Meckling [3], Green [2], Williams [11]), and informational asymmetries (e.g., Williamson [12], Myers and Majluf [8]). Thus, I do not claim that the following manuscript presents a complete capital structure theory. However, in constructing any complete theory, tax effects must be understood. Moreover, as tax law changes, we would like to know how different provisions enter the capital structure choice problem and, thus, to predict the effects of such changes. In the latter and more modest vein, this analysis aims to make a contribution.

The paper is organized as follows: Section II presents a brief description of relevant tax law provisions. Section III constructs the formal model. In Section IV, the entrepreneur's choice problem is developed. Sections V and VI derive equilibrium capital structure outcomes with and without "at risk" loss limitations. Finally, some concluding observations are given in Section VII.

II. U.S. PARTNERSHIP AND S CORPORATION TAX LAW

Several features of partnership and S Corporation law are important in constructing a tax-based model of closely-held firms' capital structure choices:

(1) No Corporate Taxes. Neither form of organization requires payment of taxes at the firm level. Income, losses, allowances and credits are all passed on directly, without tax, to the firm's owners. These flows are then reported on the owner's personal tax returns.[1]

(2) Sharing Rules. For S Corporations, there is a single class of stock, each share of which entitles its owner to a fixed share of all corporate assets and flows. For example, if there are N outstanding shares of corporate stock and individual i owns n_i shares, i is allocated the proportion n_i/N of corporate operating income, operating loss, tax credits, capital gains and losses, depreciation, interest, and other deductions.

For partnerships, sharing rules can be much more complicated. In principle, a partner can be allocated a distinct percentage share of each item of income, loss, gain, deduction, and credit. However, the IRS will disregard allocations which do not have "substantial economic effect"; in other words, the allocation cannot be purely for the purpose of tax evasion, but rather must alter the distribution of proceeds among the partners when the partnership is liquidated. In many cases, the latter rule limits partnerships' ability to arbitrarily distribute tax deductions and credits among its owners.

(3) Capital Gains/Losses upon Sale of Partner's/Shareholder's Interest. For the regular (C) Corporation, an individual shareholder's capital gain/loss is just the difference between selling and original purchase price of the shares. The gain/loss implicitly incorporates retained earnings and losses which, until sale of the shares, are not taxed at the personal level. However, for partnerships and S Corporations, earnings and losses are taxed at the personal level as they occur, making the capital gain/loss calculation more complicated. For the latter organizational forms, capital gains and losses are calculated as the difference between sale proceeds and an individual's "basis" in the firm. The "basis" includes the original purchase price of the

interest, plus income and capital gains allocated to the owner, less allocated deductions and losses (both operating and capital), and less any distributions to the owner.[2]

(4) Tax Carryforward Rules. Tax losses can be used to obtain a refund on taxes paid within the past three years, while they can be offset against future taxable profits within the following fifteen years. However, since profits and losses accrue to owners at the time they are earned, these carryforwards cannot be transferred to new owners.

(5) Loss Limits. When a partnership or S Corporation makes losses, an owner cannot take a tax loss greater than the amount for which he is considered to have "at risk." The latter amount is just the owner's "basis," excluding any allocation of firm liabilities for which the owner is not personally liable. In general, however, tax credits can be taken in full even if allocated losses exceed the "at risk" limit.[3] In addition, if an owner receives a salary or royalty from the firm, the proceeds from these payments are pooled with any losses on the owner's investment when calculating taxable profit/loss. Therefore, the at-risk limit only comes into play if the loss allocated to an owner is greater than the combined total of the owner's "basis" and his salary/royalty from the firm.

III. THE MODEL

To interpret the foregoing tax rules in a capital structure choice model, consider the following two-date problem: An entrepreneur has a firm with some assets in place and a viable set of economic activities for the coming period. These activities require an additional investment of \$I, which must be raised from outside investors. The entrepreneur must choose the proportions of the investment to be raised with equity (i.e., shareholder or partner) shares and with debt. Both the entrepreneur and investors are assumed to be risk neutral, thereby abstracting from risk-sharing considerations. The investors are competitive in that they are willing to offer any financial terms which give them a post-tax return equal to ρ, the return on a risk-free, tax-free bond. Investors are also assumed to have, in every event, sufficient taxable income from other sources to utilize any and all tax losses which they are allocated. Personal tax rates (for both ordinary income and capital gains) are τ for the investors and $\tau - \gamma$ for the entrepreneur.[4,5] For narrative convenience, investors are assumed to have a tax rate at least as high as the entrepreneur, implying that $\gamma \in [0,\tau]$; when relevant, implications of relaxing this assumption will be noted.

With the new investment, the firm will produce a stochastic end-of-period value of π (including both profit and asset worth), as well as a set of tax credits, CR. In addition, the firm has a fixed set of non-cash tax deductions (i.e., depreciation) of D, as in DeAngelo and Masulis [1]. The entrepreneur's "basis" in the firm is BV, the current book value of the original assets.[6] The entrepreneur is also endowed with a set of non-transferable tax carryforwards, TC; specifically, if TC is negative, it represents accumulated losses which can be used to reduce the entrepreneur's taxes on any positive firm profits he is allocated; likewise, if TC is positive, it represents accumulated profits which the entrepreneur can use to obtain a tax refund on any firm losses he is allocated, even if he is paying no taxes (i.e., his current period losses more than offset all of his current taxable income).

Debt will be assumed to take a standard form, paying off the minimum of a promised fixed payment, z, and the value of the firm, π. The proportion of the investment raised with debt will be denoted by $\beta \varepsilon [0,1]$. Equity financing will be characterized by a single proportional share, α; that is, external equity investors will be issued an α% share in the firm. With a partnership, more complicated sharing rules are possible. However, since qualitative implications of this analysis are unaltered by adding share parameters, the following discussion limits its attention to the single parameter case.

Note that in order to focus on the debt/equity choice problem of a closely held firm, this formulation leaves some important issues in the background, including:

(1) the choice of a partnership/S corporation organizational form, rather than a C corporate form, and

(2) endogenous tax characteristics of the marginal investor in entrepreneurial projects (e.g., Miller [5]).

Without addressing these issues fully, a brief defense of my specification may be in order. Suppose that the entrepreneur has monopoly access to a sequence of investment projects which he operates through the firm. Then, abstracting from transactions cost considerations, the only difference between a closely held organization and its corporate counterpart is that owners of the latter firm pay corporate (as well as personal) taxes and are better able to defer personal taxes.[7] From the standpoint of the marginal investor in a Miller [5] equilibrium, this difference is a matter of <u>in</u>difference; the taxes paid on the marginal investor's stake in firm profits (which may include both debt and equity components) will be the same whether taxed immediately and only at the personal level (at Miller's τ_{PB} rate) or taxed at the corporate level but deferred for personal taxation (at a net tax rate of $[1-(1-\tau_c)(1-\tau_{PE})]$, where τ_c is the corporate tax rate and τ_{PE} the "deferred" personal tax rate). However, from the standpoint of the entrepreneur, this difference is important; if the entrepreneur's tax characteristics, $(\tau^e_{PB}, \tau^e_{PE})$, are such that $\tau^e_{PB} < [1-(1-\tau_C)(1-\tau^e_{PE})]$, the entrepreneur will pay <u>fewer</u> taxes on his stake in firm profits under an S-corporation or partnership regime. Hence, in this case, a closely held organizational structure will emerge.

IV. THE ENTREPRENEUR'S CHOICE PROBLEM

Let $T_E(z,\alpha)$, $T_S(z,\alpha)$ and $T_D(z,\alpha)$ denote the expected taxes to be paid on firm payoffs by the entrepreneur, outside equity holder and debt holder, respectively. Since the entrepreneur faces a competitive capital market, he will choose the financial contract parameters, z and α, to maximize his net expected end-of-period payoff subject to investors receiving their required after-tax return. Formally, his maximization problem can be stated as follows:

$$\max_{z,\alpha,\beta} \int_z^{\infty} (1-\alpha)(\pi-z)f(\pi)\,d\pi \; - \; T_E(z,\alpha) \tag{1}$$

subject to:

$$\text{(i)} \qquad \int_z^{\infty} \alpha(\pi-z)f(\pi)\,d\pi - T_S(z,\alpha) = (1-\beta)I(1+\rho)$$

$$\text{(ii)} \qquad \int_0^{z} \pi f(\pi)\,d\pi + (1-F(z))z - T_D(z,\alpha) = \beta I(1+\rho)$$

where f( ) and F( ) denote the density and distribution functions of π. The maximand in (1) gives the entrepreneur's expected post-tax proceeds. The left-hand side of (i) gives the equity holders' expected post-tax payoff, while the right-hand side gives the required expected payoff on the equity investment, $(1-\beta)I$. Likewise, (ii) ensures that debt holders receive the required expected return on their investment, βI.[8] Note that (i) and (ii) implicitly define z and α as functions of β, so that the entrepreneur is actually choosing only one parameter, the debt ratio.

Substituting from the constraints, (1) can be rewritten as follows:

$$\max_{z,\alpha,\beta} \quad E(\pi) - I(1+\rho) - T_E(z,\alpha) - T_S(z,\alpha) - T_D(z,\alpha) \tag{1'}$$

subject to (i) and (ii). <u>Thus, the entrepreneur wants to choose a capital structure which minimizes the total tax bill of the firm's claimants</u>.

The next step is to express the claimant's expected tax bills formally:

(A) <u>Debt-Holder Taxes</u>

T_D can be expressed as follows:

$$T_D(z,\alpha) = \tau\left[E(\min(\pi,z)) - \beta I\right]. \tag{2}$$

The bracketed difference gives the debt-holders' expected profit on their investment in the firm.

(B) The Entrepreneur's Taxes

To formalize the entrepreneur's tax liability, we must first establish the way in which tax carryforwards enter the problem. Appendix A shows that, with TP denoting the entrepreneur's taxable profit before carryforwards, the taxable profit/loss after carryforwards, TP*, is as follows:[9]

$$TP^{*} = \max(TP+TC, 0) - X, \tag{3}$$

where

$$X \equiv \begin{cases} 0 & \text{if } TC < 0 \\ TC & \text{if } TC > 0 \end{cases} .$$

In other words, the entrepreneur's tax bill will be $(\tau - \gamma)$ TP* (ignoring tax credits). Note that, since X represents a constant, it can (and will) be ignored without loss of generality.

To describe (TP+TC) in (3), note first that the entrepreneur actually receives $(1-\alpha)(\pi-\min(\pi,z))$, his share of firm value net of debt payments. But this amount represents a gross payoff, from which the entrepreneur's "investment," BV, must be deducted in order to calculate his profit (i.e., the change in his "basis"). In the absence of tax credits CR, and the non-cash deductions D, this net payoff, $(1-\alpha)(\pi-\min(\pi,z)) - BV$, would represent the entrepreneur's taxable profit/loss from the firm. However, D measures the firm's ability to shield equity payoffs from taxes with, for example, depreciation deductions on reinvested profits. In addition, a proportion of tax credits may have to be deducted from the owner's basis in calculating his taxable gain/loss (as with the former Investment Tax Credit). Here, I will define the parameter δ as the extent to which tax credits must be deducted from basis. If $\delta = 0$, no deduction is required, which is the case under present U.S. tax law. If $\delta = 1$, full deduction is required. For $\delta \in (0,1)$, the parameter represents the proportion of required deduction.

Adding tax credits and non-cash deductions, the entrepreneur's taxable profit/loss from the firm is: $(1-\alpha)(\pi-\min(\pi,z)-D) - (BV-\delta(1-\alpha)CR)$. But to calculate the entrepreneur's tax bill, a few other variables are still to be added: (i) tax carryforwards, TC; (ii) the entrepreneur's income from outside the firm, which will be denoted by OI; (iii) the benefit of allocated tax credits; and (iv) the entrepreneur's other firm-related deductions, which will be denoted by ED_2. ED_2 includes deductible expenses which the entrepreneur incurs in connection with the firm (but on his own account). More importantly, if the entrepreneur is paid a royalty or salary by the firm, ED_2 will include the negative of the royalty/salary. Similarly, if the entrepreneur can disguise portions of his other (non-firm) income as royalty from the firm, these portions will be included in ED_2.[10] ED_2 will turn out to be an important determinant of "at-risk" limit effects since these deductions enter the entrepreneur's calculation of firm-related profits/losses before at risk limits are applied.

The entrepreneur's expected tax bill can now be fully characterized. In order to expose the importance of tax loss limits for the capital structure choice problem, this paper will examine both a case of no loss limits and that of at-risk limitations of the kind described in Section II.

Case 1: No Tax Loss ("At Risk") Limits

Here, the entrepreneur can use his share of firm losses to offset any other income he may have. Formally (using equation (3)),

$$T_E(z,\alpha) = E\left\{\max\left[0,(\tau-\gamma)\bullet\left[(1-\alpha)(\pi-\min(\pi,z)-D) - (ED-\delta(1-\alpha)CR)\right] - (1-\alpha)CR\right]\right\} \quad (4)$$

where, for notational convenience, ED represents the entrepreneur's set of non-transferable deductions:

$$ED \equiv ED_1 + ED_2$$

$$ED_1 \equiv BV - TC - OI \quad (5)$$

Case 2: At-Risk Loss Limits

Here, taxes on other income can be offset by allocated tax credits, but the extent to which allocated losses can be offset against this other income is limited. Formally, TP+TC in (3) is now:

$$TP+TC = \max\,[0,(1-\alpha)(\pi-\min(\pi,z)-D) - ED_2] - [ED_1 - \delta(1-\alpha)CR] \quad (6)$$

The max[ ] operator limits allocated tax losses (net of firm-related income) to the entrepreneur's "basis" (adjusted for tax credits). Whenever taxes on TP+TC are more than offset by allocated tax credits, the entrepreneur pays zero tax. Thus, expected taxes will be:

$$T_E(z,\alpha) = E\left\{\max\,(0, (\tau-\gamma)(TP+TC) - (1-\alpha)CR)\right\}. \quad (7)$$

where (TP+TC) is as given in (6).

(C) Outside Equity-Holder Taxes

Again, two cases are distinguished:

Case 1: No Tax Loss Limits

Since investors can always use tax losses, their expected taxes in this case are:

$$T_S(z,\alpha) = E\left\{\tau\left[\alpha(\pi\text{-}\min(\pi,z)\text{-}D) - \left[(1\text{-}\beta)I - \alpha\delta CR\right]\right] - \alpha CR\right\}. \tag{8}$$

The outside equity-holders' basis (before tax credit adjustments) is just their original investment, (1-β)I; hence, equation (8) follows from the same reasoning as given for equation (4).

Case 2: At-Risk Loss Limits

Here, equity-holders cannot use allocated firm losses beyond their capital "at-risk." Thus,

$$T_S(z,\alpha) = E\left\{\tau\left[\max\left[0,\alpha(\pi\text{-}\min(\pi,z)\text{-}D)\right] - \left[(1\text{-}\beta)I - \alpha\delta CR\right]\right] - \alpha CR\right\}. \tag{9}$$

V. CAPITAL STRUCTURE CHOICE WITH NO TAX LOSS LIMIT

Two situations must be distinguished in analyzing the entrepreneur's capital structure choices: (1) when there are states of nature in which the entrepreneur's non-negative tax constraint is binding and, hence, the entrepreneur cannot use some of his tax losses, and (2) when tax losses can always be used. Using equation (4), these two situations can be characterized by the following inequalities:

$$Y \equiv (1\text{-}\alpha)D + ED + (1\text{-}\delta(\tau-\gamma))(1\text{-}\alpha)CR/(\tau-\gamma) \qquad (10)$$

$$> 0 \text{ in situation (1)}$$

$$< 0 \text{ in situation (2)}$$

Y can be interpreted as the entrepreneur's tax loss when the firm pays nothing in profits to its shareholders (i.e., $\pi = \min(\pi,z)$ and bond-holders get only π). If $Y < 0$, then even when the firm's profits are so low that bondholders take all profits, the entrepreneur can use all of his tax deductions (i.e., D, ED and CR) since he is still paying some tax. However, if $Y > 0$, then the entrepreneur will pay no taxes when $\pi = \min(\pi,z)$, and some of his tax deductions will go unused.

Note that a sufficient condition for situation (1) is that $ED > 0$ and a necessary condition for situation (2) is that $ED < 0$. For example, if the entrepreneur has carryforward tax losses, little other income (OI) and little salary or royalty from the firm, situation (1) will emerge. Conversely, if the entrepreneur has substantial outside income and/or salary from the firm, situation (2) will emerge.

Situation (1): Using (1'), (2), (4), (8), and (10), the capital structure choice problem can be stated as one to minimize total expected taxes:

$$\min_{\beta \varepsilon [0,1]} \quad T(\beta) \equiv \tau \left\{ \int_0^z \pi f(\pi) d\pi + z(1-F(z)) - \beta I \right\} \tag{11}$$

$$+ \left\{ \tau \left[\alpha \int_z^\infty (\pi - z) f(\pi) d\pi - \alpha D - (1-\beta) I \right] - \alpha(1-\delta\tau) CR \right\}$$

$$+ \int_{\pi^*}^\infty \left\{ (\tau-\gamma) \left[(1-\alpha)(\pi - z - D) - ED \right] - (1-\delta(\tau-\gamma))(1-\alpha) CR \right\} f(\pi) d\pi ,$$

where $\pi^* \equiv z + \frac{Y}{1-\alpha}$ and $\alpha = \alpha(\beta)$ and $z = z(\beta)$ solve the following equilibrium conditions (the analogs of constraints (i) and (ii) in (1)):

$$(1-\tau)\alpha \int_z^\infty (\pi - z) f(\pi) d\pi + \alpha(D\tau + (1-\delta\tau)CR) = (1-\beta) I (1+\rho-\tau) \tag{12}$$

$$(1-\tau) \left[\int_0^z \pi f(\pi) d\pi + z(1-F(z)) \right] = \beta I (1+\rho-\tau). \tag{13}$$

The first, second and third bracketed terms in (11) give the expected tax bills of debt-holders, equity investors and the entrepreneur, respectively. Since the entrepreneur pays no taxes when $\pi < \pi^*$ (where $\pi^* > z$ due to (10)), the third integral is truncated at this point.

Differentiating (11):

$$\frac{dT}{d\beta} = \Big\{ \tau \, [\int_{z}^{\infty} (\pi\text{-}z)f(\pi)d\pi - D] - (1\text{-}\delta\tau)CR \qquad (14)$$

$$- (\tau-\gamma) \int_{\pi^*}^{\infty} (\pi\text{-}z\text{-}D)f(\pi)d\pi + (1\text{-}\delta(\tau-\gamma))CR(1\text{-}F(\pi^*)) \Big\} \frac{d\alpha}{d\beta}$$

$$+ \Big\{ (1\text{-}\alpha)[\tau(1\text{-}F(z)) - (\tau-\gamma)(1\text{-}F(\pi^*))] \Big\} \frac{dz}{d\beta}$$

where, from (12) and (13),

$$\frac{dz}{d\beta} = \frac{I(1+\rho-\tau)}{(1\text{-}F(z))(1\text{-}\tau)} \qquad (15)$$

$$\frac{d\alpha}{d\beta} = \frac{-I(1+\rho\text{-}\tau)(1\text{-}\alpha)}{(1\text{-}\tau)\int_z^{\infty} (\pi\text{-}z)f(\pi)d\pi + [D\tau + (1\text{-}\delta\tau)CR]} \,. \qquad (16)$$

To determine the optimal capital structure, I will now want to sign $\frac{dT}{d\beta}$ in (14). To this end, define $k \equiv \gamma/\tau \in [0,1]$. Then, with some work, (14) can be rewritten as follows:

$$\frac{dT}{d\beta} = \frac{\tau(1\text{-}\alpha)I(1+\rho-\tau)}{(1\text{-}\tau)} \bullet (A + B) \qquad (17)$$

where $$A = 1 - \frac{\int_z^{\infty} (\pi\text{-}z)f(\pi)d\pi - D - \frac{(1\text{-}\delta\tau)CR}{\tau} + \frac{CR(1\text{-}F(\pi^*))}{\tau}}{\int_z^{\infty} (\pi\text{-}z)f(\pi)d\pi + \frac{D\tau}{1\text{-}\tau} + \frac{(1\text{-}\delta\tau)CR}{(1-\tau)}}$$

$$B = \frac{(1-k)(1-F(\pi^*))}{(1-F(z))} \bullet \left\{ \frac{E_{\pi>\pi^*}(\pi) - z - D + \delta CR}{E_{\pi>z}(\pi) - z + \frac{D\tau + (1-\delta\tau)CR}{(1-F(z))(1-\tau)}} - 1 \right\}$$

and $E_{\pi>x}(\pi)$ represents the conditional expectation, conditioned on the subscript. Note that A is positive whenever CR > 0, or D > 0, and zero when CR = D = 0. Since B = 0 at k = 1, (17) implies that $\frac{dT}{d\beta} > 0$ at $\gamma = \tau$ so long as D > 0 or CR > 0. To evaluate $\frac{dT}{d\beta}$ at k = 0, the other endpoint, rewrite (17):

$$\left.\frac{dT}{d\beta}\right|_{k=0} = \frac{\tau(1-\alpha)I(1+\rho-\tau)(F(\pi^*)-F(z))}{(1-\tau)(1-F(z))} \bullet \tag{18}$$

$$\left\{ 1 - \frac{E_{\pi\varepsilon(z,\pi^*)}(\pi) - z + \frac{-D\tau F(\pi^*) - CR(1-\delta\tau)F(\pi^*)}{\tau(F(\pi^*) - F(z))}}{E_{\pi>z}(\pi) - z + \frac{D\tau + (1-\delta\tau)CR}{(1-F(z))(1-\tau)}} \right\} > 0$$

where the inequality follows from $E_{\pi>z}(\pi) \geq E_{\pi\varepsilon(z,\pi^*)}(\pi)$. It remains to evaluate $\frac{dT}{d\beta}$ at k ε (0,1). Though the sign of B in (17) appears ambiguous, the following argument, drawing on the inequality in (18), demonstrates that $\frac{dT}{d\beta}$ is positive:

Since $\frac{dT}{d\beta}$ (in (17)) is a differentiable function of k and is positive at k = 0 (equation (18)), a necessary condition for $\frac{dT}{d\beta} \leq 0$ for a given β is that there exists a k* such that $\left.\frac{dT}{d\beta}\right|_{k=k^*} = 0$ and, as k approaches k* from below, $\frac{\partial}{\partial k}\left(\frac{dT}{d\beta}\right) < 0$ (see Figure 1). Note first that, if D = CR = 0 with k < 1, then A = 0 and B > 0, implying that D or CR must be positive in order for $\frac{dT}{d\beta}$ to be non-positive. Further, since $A > 0$ in this case, B must be negative as k approaches k^*. Now consider the following derivative:

$$\frac{\partial}{\partial k}\left(\frac{dT}{d\beta}\right) = \frac{\tau(1-\alpha)I(1+\rho-\vartheta)}{(1-\tau)} \left\{ \frac{-B}{1-k} \right. \tag{19}$$

$$\left. + \frac{\partial \pi^*}{\partial k} \bullet \left[\frac{CR \bullet f(\pi^*) + \tau(1-k)(1-F(\pi^*))\partial E_{\pi>\pi^*}(\pi)/\partial \pi^*}{\tau \{\int_z^{\infty} (\pi-z)f(\pi)d\pi + [D\tau + (1-\delta\tau)CR]/(1-\tau)\}} - \frac{f(\pi^*)B}{(1-k)(1-F(\pi^*))} \right] \right\}$$

where $\frac{\partial E_{\pi>\pi^*}(\pi)}{\partial \pi^*} > 0$ and, using the definition of π^* in (11), $\frac{\partial \pi^*}{\partial k} = \frac{CR}{\tau(1-k)^2} > 0$. Thus, since B is negative as k approaches k^*, $\frac{\partial}{\partial k}\left(\frac{dT}{d\beta}\right) > 0$ as k approaches k^*, violating the necessary condition for $\frac{dT}{d\beta} \leq 0$.

In summary, $\frac{dT}{d\beta} > 0$ unless $CR = D = 0$ and $\gamma = \tau$, in which case $\frac{dT}{d\beta} = 0$. Thus, for situation (1), all-equity capital structures are optimal in all but the latter case, in which there is no optimal capital structure.

The strength of this result is somewhat startling. On one hand, it is not surprising that the entrepreneur would like to sell the tax deductions, D, and tax credits, CR, to investors via equity financing; by assumption, investors have a higher tax rate and, hence, get a higher payoff from the deductions; in addition investors are always able to use all deductions and credits, unlike the entrepreneur.

However, even when there are no deductions or credits to transfer (i.e., $D = CR = 0$), equity-financing is favored.[11] In this case, the only tax consideration entering the capital structure choice problem is the entrepreneur's non-transferable tax deductions and losses, $ED > 0$. Capital structure matters to the extent that it affects the value of these offsets to taxable income.

To illustrate the trade-offs, Figure 2 depicts two extreme cases: all-equity and all-debt. With equity, the tax deductions will yield some savings in all states of nature; for low profit levels, the deductions can be only partially used, while, for high profit levels, they can be fully used. The probability-weighted shaded area under the entrepreneur's residual profit curve ($(1-\alpha)\pi$) measures the expected value of these offsets with the equity regime. With debt, the deductions cannot be used at all in states with very low profits, since, in these circumstances, debt repayments fully absorb all profit. However, there can be intermediate profit states in which the entrepreneur's tax offsets can be used fully with debt and only partially with equity (as depicted). The relative values of the deductions under the two regimes is not obvious, a priori. In fact, the graphical construction in Figure 2 suggests that, with a high enough ED, debt could dominate equity. However, the foregoing analysis demonstrates that this conclusion is erroneous. When the equilibrium relationship between α and z is considered, a "high enough" ED can be shown to be one which is too high in the following sense: $ED/(1-\alpha)$ must be higher than the maximum possible profit level. Hence, the appearance in Figure 2 of a larger shaded area with debt than with equity reflects zero probability weight on some of the area.

Situation (2): In this case, the entrepreneur always pays some taxes and, hence, uses his firm-related tax allowances. Thus, using (4),

$$T(\beta) = \tau\left\{\int_0^z \pi f(\pi)d\pi + z(1-F(z)) - \beta I\right\} \tag{20}$$

$$+ \left\{\tau[\alpha\int_z^\infty (\pi-z)f(\pi)d\pi - \alpha D - (1-\beta)I] - \alpha(1-\delta\tau)CR\right\}$$

$$+ \left\{(\tau-\gamma) \bullet [(1-\alpha)\int_z^\infty (\pi-z)f(\pi)d\pi - (1-\alpha)D - ED] - (1-\alpha)(1-\delta(\tau-\gamma))CR\right\}$$

where α and z satisfy (12) and (13). Differentiating, substituting for $\frac{d\alpha}{d\beta}$ and $\frac{dz}{d\beta}$, and rewriting:

$$\frac{dT}{d\beta} = \frac{\gamma(1-\alpha)(1+\rho-\tau)I}{(1-\tau)} \bullet \left\{1- \frac{\int_z^\infty (\pi-z)f(\pi)d\pi - D + \delta CR}{\int_z^\infty (\pi-z)f(\pi)d\pi + \frac{[D\tau + (1-\delta\tau)CR]}{(1-\tau)}}\right\} \tag{21}$$

It is easily verified that $\frac{dT}{d\beta}$ <u>is positive and, thus, all-equity capital structures prevail, so long as $\gamma > 0$ and either (i) $D > 0$ or (ii) $CR > 0$ and $\delta < 1$</u>.

If γ were negative and (i) or (ii) were satisfied, $\frac{dT}{d\beta}$ would be negative.

These results are not entirely as one might expect. On the one hand, it is not surprising that the presence of positive transferable deductions, D, favor equity. In situation (2), the investor and the entrepreneur have an equal ability to utilize the firm's tax shields and the entrepreneur has no "extra" deductions (i.e., ED is negative). But the tax shields D have a higher value to the investor than the entrepreneur when the investor has a higher tax rate ($\gamma > 0$). Thus, the entrepreneur would like to transfer these shields with equity financing. On the other hand, however, the tax credits CR have a higher value to the entrepreneur so long as $\delta\gamma > 0$; both the investor and the entrepreneur fully use their allocated tax credits, but the tax cost of the associated deduction from basis (δ per dollar of tax credit) is less for the entrepreneur due to his lower tax rate. Hence, condition (ii) appears somewhat mysterious. Its explanation is as follows: when tax credits are transferred to an outside equity-holder, there is a net tax cost of $\delta\gamma$ per dollar credit transferred. However, the transfer also reduces the taxable payments which the entrepreneur must make to outside investors and increases the taxable income of the entrepreneur by the same amount. Roughly speaking, the reduction is equal to the value of the credit, thus yielding a net tax savings of γ per dollar. Since $\gamma > \delta\gamma$ whenever $\delta < 1$, condition (ii) emerges.

VI. CAPITAL STRUCTURE CHOICES WITH AT-RISK LOSS LIMITS

At-risk limitations introduce an additional set of tax asymmetries which, as will be shown, can lead to ambiguity in the optimal capital structure choice.

A. Four Situations

Equations (6) and (7) reveal four distinct situations which must be considered. From (6), there can be states of nature in which the "at-risk" limitation binds the entrepreneur (call this situation I) or alternatively, this limitation may never bind (call this situation II). From (7), there may be states of nature in which the entrepreneur cannot fully use the allocated tax credit (call this situation A) or, alternatively, he may always be able to use the credit (call this situation B). At the outset, we must characterize $T_E(z,\alpha)$ in these four cases:

Situation IA: Formally, this case is characterized by the following conditions:

$$Y_1 \equiv (1-\alpha)\, D + ED_2 > 0 \tag{22a}$$

$$Y_2 \equiv ED_1 + \frac{(1-\alpha)CR(1-\delta(\tau-\gamma))}{(\tau-\gamma)} > 0 \tag{22b}$$

Y_1 represents the entrepreneur's set of firm-related tax deductions that are subject to "at-risk" limitations; if Y_1 is positive, these deductions will <u>not</u> be exploitable when profits are so low that $\pi = \min(\pi,z)$--that is, when the firm defaults on its debt obligations. Y_2 represents the entrepreneur's "effective" tax loss when the "at-risk" limitation is binding--that is, when the entrepreneur takes a loss on firm-related activities which is equal to his basis (adjusted for tax credits). If Y_2 is positive, then the entrepreneur will not be able to use all of the component deductions in the event of binding at-risk limits; in this event, either some tax credit will go unexploited or some of the "basis" deduction will be lost or both. Note that $Y_1 + Y_2 = Y$ (from equation (10)), so that Y_1 and Y_2 simply break up the entrepreneur's <u>potential</u> tax loss in the event of firm default on its debt.

Also note that (22) will be satisfied if ED_1 is positive and ED_2 is positive or small. For example, situation IA will emerge if the entrepreneur receives a salary from the firm which is small relative to the depreciation allowances

(D) and has outside income (OI) which is small relative to his basis, BV, plus any carryforward tax losses.

For this case, (7) can be written:

$$T_E(z,\alpha) = (\tau-\gamma) \int_{\pi^*}^{\infty} \left\{ (1-\alpha)(\pi-z-D- \frac{(1-\delta(\tau-\gamma))CR}{(\tau-\gamma)}) - ED \right\} f(\pi)d\pi \qquad (7')$$

where, as in (11), $\pi^* \equiv z + (Y_1 + Y_2)/(1-\alpha)$. Thus, the only difference between this situation and the corresponding case in Section V (Situation (1)) is that the investor cannot always use his allocated tax deductions here (see equations (8) and (9)).

Situation IIA: Here, the analogs to (22) are:

$$Y_1 < 0 \text{ and } Y_1 + Y_2 > 0 \qquad (23)$$

Since Y_1 is negative, "at-risk" limitations are never binding here. However, since Y is positive, the entrepreneur sometimes pays no taxes and, in this event, he will be unable to exploit his tax shields fully. This situation can emerge when the entrepreneur has a small outside income (OI) and a rather large salary from the firm--that is, a salary which is large enough to overshadow the entrepreneur's share of depreciation deductions (implying $Y_1 < 0$), but not so large as to overshadow his basis plus carryforward tax losses (implying $Y > 0$). It is easily verified that (7') also characterizes T_E in this case.

Situation IB: Here,

$Y_1 > 0$ and $Y_2 < 0$ (24)

This situation can emerge when the entrepreneur has both a small salary from the firm (relative to D) and a rather large outside income (relative to his "basis" and tax loss deductions). In this instance, (7) can be written:

$$T_E(z,\alpha) = (\tau-\gamma)\left[-Y_2 + \int_{z+\frac{Y_1}{1-\alpha}}^{\infty} \{(1-\alpha)(\pi-z) - Y_1\} f(\pi)d\pi\right] \qquad (7'')$$

Situation IIB: Finally, in this last and most interesting case,

$Y_1 < 0$ and $Y_1 + Y_2 < 0$ (25)

Thus, the analog to (7) is:

$$T_E(z,\alpha) = (\tau-\gamma)\left\{(1-\alpha)\int_{z}^{\infty}(\pi-z)f(\pi)d\pi - (Y_1 + Y_2)\right\} \qquad (7''')$$

This situation will emerge when the entrepreneur has a rather large salary from the firm or an ability to funnel other income through the firm (implying $ED_2 < 0$), a history of taxable firm profits, a relatively small "basis" (BV) and, perhaps (though not necessarily), substantial outside income. These conditions imply that the entrepreneur will be in a position to exploit any firm-level tax shields fully. They are also, I believe, plausible for a wide spectrum of small business enterprises.

B. Situations IA and IIA

In these first two cases, T(β) can be written using (7'):

$$T(\beta) = \tau \left\{ \int_0^z \pi f(\pi)d\pi + z(1\text{-}F(z)) - I + \alpha \int_{z+D}^{\infty} (\pi\text{-}z\text{-}D)f(\pi)d\pi \right\} \tag{26}$$

$$- \alpha(1-\delta\tau)CR + T_E(z,\alpha)_{(7')}$$

where z = z(β) solves (13) and α = α(β) solves

$$\alpha \int_z^{\infty} (\pi\text{-}z)f(\pi)d\pi - \alpha\tau \int_{z+D}^{\infty} (\pi\text{-}z\text{-}D)f(\pi)d\pi + \alpha(1-\delta\tau)CR \tag{9'}$$

$$= (1+\rho-\tau)(1-\beta)I$$

Substituting from (13) and (9'), (26) can be written:

$$T(\beta) = \frac{(1+\rho-\tau)I}{(1\text{-}\tau)}(\beta - (1-\tau)) + \alpha \int_z^{\infty} (\pi\text{-}z)f(\pi)d\pi - \tau I + T_E(z,\alpha)_{(7')} \tag{26'}$$

Differentiating and substituting for $\frac{dz}{d\beta}$ and $\frac{d\alpha}{d\beta}$,

$$\frac{dT}{d\beta} = (1+\rho-\tau)(1-\alpha) \bullet \Bigg\{ 1 + \frac{\tau(F(\pi^*) - F(z)) + \gamma(1-F(\pi^*))}{(1-F(z))(1-\tau)} \tag{27}$$

$$- \frac{[1-\alpha x]}{1-\alpha} \bullet \left[\frac{\int_z^\infty (\pi-z)f(\pi)d\pi - (\tau-\gamma)\int_{\pi^*}^\infty (\pi-z-D-\frac{(1-\delta(\tau-\gamma))CR}{(\tau-\gamma)})\, f(\pi)d\pi}{\int_z^\infty (\pi-z)f(\pi)d\pi - \tau\int_{z+D}^\infty (\pi-z-D)f(\pi)d\pi + (1-\delta\tau)CR} \right] \Bigg\}$$

where $$x \equiv \frac{(1-F(z)) - \tau(1-F(z+D))}{(1-F(z))(1-\tau)} > 1$$

As in Section V, let us evaluate (27) at the two endpoints for γ, 0 and τ.

At $\gamma = \tau$,

$$\left.\frac{dT}{d\beta}\right|_{\gamma=\tau} = \frac{(1+\rho-\tau)I(1-\alpha)}{(1-\tau)} \bullet \Bigg\{ 1 \tag{28}$$

$$- (\frac{1-\alpha x}{1-\alpha}) \left[\frac{(1-\tau)\int_z^\infty (\pi-z)f(\pi)d\pi + (1-\tau)CR(1-F(\pi^*))}{\int_z^\infty (\pi-z)f(\pi)d\pi - \tau\int_{z+D}^\infty (\pi-z)f(\pi)d\pi + D\tau(1-F(z+D)) + (1-\delta\tau)CR} \right] \Bigg\}$$

It is easily verified that this derivative is always <u>positive</u>.

To evaluate at $\gamma = 0$, two cases must be considered: (i) $\pi^* > z+D$ and

(ii) $\pi^* < z+D$. Note that a sufficient condition for (i) is that ED > 0, while a necessary condition for (ii) (and a sufficient one if CR = 0) is that ED < 0. In the first case,

$$\left.\frac{dT}{d\beta}\right|_{\gamma=0,\ \pi^*>z+D} > (1+\rho-\tau)I(1-\alpha)\tau \bullet \left\{ \frac{F(\pi^*) - F(z)}{(1-F(z))(1-\tau)} \right. \tag{29}$$

$$\left. - \left[\frac{\int_{z+D}^{\pi^*}(\pi-z-D)f(\pi)d\pi - F(\pi^*)(1-\delta\tau)CR/\tau}{\int_{z}^{\infty}(\pi-z)f(\pi)d\pi - \tau\int_{z+D}^{\infty}(\pi-z-D)f(\pi)d\pi + (1-\delta\tau)CR} \right] \right\}$$

$$> \frac{(1+\rho-\tau)I(1-\alpha)\tau[F(\pi^*) - F(z+D)]}{(1-\tau)(1 - F(z+D))} \bullet \left\{ \left[\frac{F(\pi^*) - F(z)}{F(\pi^*) - F(z+D)} \Big/ \frac{1 - F(z)}{1 - F(z+D)} \right] \right.$$

$$\left. - \left[\frac{E_{\pi\varepsilon[z+D,\pi^*]}(\pi) - z - D - F(\pi^*)(1-\delta\tau)CR/\tau(F(\pi^*)-F(z+D))}{E_{\pi>z+D}(\pi) - z + \frac{D\tau}{(1-\tau)} + \frac{(1-\delta\tau)CR}{(1-\tau)(1 - F(z+D))}} \right] \right\} > 0.$$

where the first inequality follows from $x > 1$, the second from

$\int_{z}^{\infty}(\pi-z)f(\pi)d\pi > \int_{z+D}^{\infty}(\pi-z)f(\pi)d\pi$, and the third from

$E_{\pi\varepsilon[z+D,\pi^*]}(\pi) < E_{\pi>z+D}(\pi)$ and

$$\left[\frac{F(\pi^*) - F(z)}{F(\pi^*) - F(z+D)} \Big/ \frac{1 - F(z)}{1 - F(z+D)} \right] > 1.$$

Together, (28) and (29) can be used to show that, for the case of $\pi^* > z+D$, $\frac{dT}{d\beta}$ is also positive for $\gamma \varepsilon (0,\tau)$. Specifically, following an argument analogous to that employed in equations (17) - (19), express $\frac{dT}{d\beta}$ as follows:

$$\frac{dT}{d\beta} = A + B \tag{30}$$

where $A \equiv \frac{dT}{d\beta} \Big|_{\gamma=\tau}$ from (28), and

$$B \equiv (\tau-\gamma)(1+\rho-\tau)I(1-\alpha)(1-F(\pi^*)) \Big\{ \frac{-1}{(1-F(z))(1-\tau)}$$

$$+ \frac{[1-\alpha x]}{1-\alpha} \bullet \frac{E_{\pi>\pi^*}(\pi) - z - D + \delta CR}{\int_z^\infty (\pi-z)f(\pi)d\pi - \tau \int_{z+D}^\infty (\pi-z-D)f(\pi)d\pi + (1-\delta\tau)CR} \Big\}$$

Given (29), a necessary condition for $\frac{dT}{d\beta} < 0$, some γ, is that the derivative of $\frac{dT}{d\beta}$ in (30) with respect to γ be negative for some γ^* satisfying: $\frac{dT}{d\beta} \Big|_{\gamma=\gamma^*} = 0$. Note that, since A is positive, B must be <u>negative</u> at such a γ^*. Taking the derivative:

$$\frac{\partial}{\partial\gamma} \left[\frac{dT}{d\beta} \right]_{(30)} = \frac{-B}{(\tau-\gamma)} \tag{31}$$

$$+ \frac{\partial\pi^*}{\partial\gamma} \Big[\frac{-Bf(\pi^*)}{(1-F(\pi^*))} + \frac{(1+\rho-\tau)I(1-\alpha x)}{\int_z^\infty (\pi-z)f(\pi)d\pi - \tau \int_{z+D}^\infty (\pi-z-D)f(\pi)d\pi + (1-\delta\tau)CR}$$

$$\bullet \{(\tau-\gamma)(1-F(\pi^*)) \frac{\partial E_{\pi>\pi^*}(\pi)}{\partial\pi^*} + f(\pi^*)CR\} \Big] > 0 \text{ at } \gamma^*$$

where the inequality follows from $B < 0$, $\frac{\partial \pi^*}{\partial \gamma} > 0$, and $\frac{\partial E_{\pi > \pi^*}(\pi)}{\partial \pi^*} > 0$. Thus, for $\pi^* > z+D$ in situations IA and IIA, (31) implies that $\frac{dT}{d\beta} > 0$ everywhere and, therefore, all-equity capital structures prevail.

Still to be considered is the case of $\pi^* < z+D$. Here,

$$\left.\frac{dT}{d\beta}\right|_{\gamma=0, \pi^* < z+D} = (1+\rho-\tau)I(1-\alpha)\tau \bullet \left\{\frac{(F(\pi^*) - F(z))}{(1-F(z))(1-\tau)} + \frac{(x-1)\alpha}{(1-\alpha)\tau} + \left[\frac{(1-\alpha x)}{(1-\alpha)}\right] \bullet C\right\} \tag{32}$$

$$\text{where } C \equiv \left[\frac{\int_{\pi^*}^{z+D} (\pi-z-D)f(\pi)d\pi + F(\pi^*)(1-\delta\tau)CR/\tau}{\int_{z}^{\infty} (\pi-z)f(\pi)d\pi - \tau \int_{z+D}^{\infty} (\pi-z-D)f(\pi)d\pi + (1-\delta\tau)CR}\right]$$

(32) does not have an unambiguous sign. For example, note that (22) and (23) permit π^* to fall arbitrarily close to z. Now suppose $\pi^* \approx z$ and, when $\beta = 0$ (i.e., when the investment is all-equity financed), α satisfies the following inequality:

$$\alpha < \frac{-C}{-Cx+(x-1)/\tau} \tag{33}$$

Since $\pi^* \approx z$ implies $\pi^* \approx 0$ at $\beta = 0 = z$, C is negative at $\beta = 0$ and the right-hand side of (33) is positive (through less than one). Using (33) to evaluate $\frac{dT}{d\beta}$ in (32) at $\beta = z = \pi^* = 0$, the sign is negative, implying that some debt will be optimal.

Conversely, suppose π^* approaches (z+D). In this case, the derivative in (32) is always positive, implying all-equity financing.

These outcomes are not devoid of intuition. When $\pi^* < z+D$, the entrepreneur can use the tax deductions D more often than the investor. The reason is that (22) and (23) both require ED_2 to be negative in order for $\pi^* < z+D$. The latter inequality implies that, due to the entrepreneur's salary or royalties or, perhaps, his ability to funnel other income through the firm, the entrepreneur is less bound by the at-risk limitation than the investor. This disadvantage of equity grows as π^* declines or, equivalently, as the number of states in which the entrepreneur can use the tax deductions D, but the investor cannot, increases. While tax credits can still be used more often by the investor, this advantage of equity evaporates as π^* approaches zero; at $\pi^* = 0$, the entrepreneur fully utilizes his tax credits. But, even at $\pi^* = 0$, debt has an extra tax disadvantage to overcome: by raising the debt proportion, the entrepreneur will increase the number of states in which debt payments fully offset taxable earnings and, hence, the tax deductions, D, cannot be used. This disadvantage of debt is reflected in the inequality, $x > 1$, which leads to the constraint in (33).

As π^* approaches or exceeds $(z+D)$, the only disadvantage of equity goes away and all-equity financing emerges.

C. Situation IB

Following algebraic arguments virtually identical to those in part B, it can be shown that all-equity capital structures emerge in situation IB whenever $ED_2 > 0$. In this instance, the investor can use the deductions D more often than the entrepreneur, while the deductions have more value to the investor so long as $\gamma > 0$. Also as in part B and for the same reasons, some debt can be optimal when $ED_2 < 0$.

D. Situation IIB

This case is particularly interesting in that all-debt capital structures can emerge. Formally, let $\gamma = 0$ (i.e., the entrepreneur has the same tax rate as investors), $D > 0$, and note that $T_E(z,\alpha)$ is the same here as in Sections V's situation (2). The $z(\beta)$ function is also unaltered by the addition of tax loss limits. However, α must now solve the following equation:

$$\alpha:\ R_o(z,\alpha,\beta) + \alpha\tau\left[\int_z^{z+D} (\pi-z)f(\pi)d\pi - DF(z+D)\right] \qquad (9'')$$

where

$$R_o(z,\alpha,\beta) \equiv \alpha(1-\tau)\int_z^{\infty}(\pi-z)f(\pi)d\pi + \alpha\tau D + \alpha(1-\delta\tau)CR - (1+\rho-\tau)(1-\beta)I$$

is the net outside-equity-holder profit without tax loss limits (see equation (8)). From Section V (equation (21)), we know that without loss limits and with $\gamma = 0$, capital structure is irrelevant. Here, for every β, z is the same as without loss limits. However, since the second term in (9'') is negative, α is higher. Hence, given that the entrepreneur's post-tax profits are declining in α, debt is now the preferred financial instrument.

On an intuitive level, tax loss limits do not affect the entrepreneur's ability to use tax shields here; in every state of nature, these shields are fully exploited. However, these limits restrict the investor's ability to use tax shields in low-profit states. In the absence of differential tax rates, the entrepreneur is in a better position to exploit these benefits and will not want to transfer them via equity financing.

With $\gamma > 0$, investors can still use tax shields less frequently than entrepreneurs, but they also realize a greater saving from those tax benefits that are used. These two offsetting influences lead to analytically ambiguous capital structure choices in this case.

VII. CONCLUSION

This paper has sought to expose some implications of tax considerations for entrepreneurial firms' capital structure choices. At the outset, it was pointed out that naive application of tax-based theories in the corporate capital structure literature implies all-equity financing. However, important features of a closely held firm's status render this naive extension inappropriate. By incorporating some of these features, this analysis has shown that capital structure can be thought of as a means to achieve a maximal value of firm-level tax shields. When the value of the firms' transferable tax benefits is greater for the entrepreneur than an outside investor, debt financing can be favored. However, if tax deductions have a higher value to investors, equity financing will be favored.

These two cases are primarily distinguished by the parameter ED_2, which, if positive, represents the entrepreneur's deductible firm-related expenses or, if negative, a measure of his ability to avoid "at-risk" tax loss limits due to royalties and salary from the firm, or an ability to funnel other income through the firm. A positive ED_2 favors equity for two reasons: (1) the value of the entrepreneur's nontransferable "deductions" ED (which also includes his basis plus tax loss carryforwards) is enhanced by equity financing (see Section V); and (2) the availability of the ED_2 deductions makes it less likely that an entrepreneur will be able to fully utilize the set of <u>transferable</u>

tax deductions and credits (D and CR); ceteris paribus, the latter tax benefits will be used relatively more often by investors, implying that they should be transferred to investors via equity financing. A negative ED_2 favors debt by permitting the entrepreneur to exploit tax losses in instances when, with tax loss limits, the investor cannot; thus, tax shields will be used more often by the entrepreneurs and should not be transferred via equity. The importance of "at risk" loss limitations is evident from this discussion. Without these limitations and with investor tax rates at least as high as the entrepreneur's, equity is always favored.

While this paper does not focus on recent changes in U.S. tax law, the logic underlying the analysis permits conjecture. Perhaps of most interest in this regard is the new passive/active distinction. The entrepreneur's income from the firm will generally be classified as active, while the investor's income will be treated as passive. This new asymmetry is likely to restrict the investor's ability to use tax losses vis-á-vis the entrepreneur, thereby favoring debt financing.

In the absence of dynamics, the implications of other tax policy changes are hard to assess, which brings me to the limitations of this analysis. Clearly, there are important complications to consider, including dynamics, stochastic income offset opportunities and endogenous royalties. Though none of these extensions promises to alter the qualitative implications of this analysis, each would expand the array of questions which could be addressed and, hence, I believe, merits inquiry.

FOOTNOTES

[1]Until recently, California required S Corporations to pay state-level corporate income taxes. However, this treatment was ended in 1987, and even before 1987, partnerships were not taxed at the firm level. In this paper, we assume that firm income is taxed only at a personal level when either organizational form is in place.

[2]Calculation of basis is also complicated by the allocation of partnership liabilities and special treatments of property contributions (see Pratt, et. al. [9]). Though the former allocations do not materially alter the capital gains calculation, the latter treatments do. For simplicity, we will assume here that owners contribute cash, thereby avoiding these issues.

[3]The one exception is the former investment tax credit (ITC); when this credit was taken in full, the basis had to be reduced by half of the credit, effectively applying the at-risk limits to this half. Even with the ITC, however, the firm could agree to take a lower credit in exchange for no adjustment to the basis.

[4]Allowing for differential tax treatment of capital gains and losses complicates the analysis without altering the fundamental economic forces underlying the paper's results. Hence, a symmetric treatment is assumed here, consistent with current U.S. tax law.

[5]For the investor, τ can be interpreted as a marginal tax rate. However, for the entrepreneur, this paper applies the tax rate $(\tau-\gamma)$ to the whole range of his income (again in the interests of analytical clarity). For many of the cases examined here, this treatment invalidates a "marginal rate" interpretation for the entrepreneur. But for some of the more interesting cases (i.e., Situation (2) in Section V and Situations IB and IIB in Section VI), a "marginal rate" interpretation is generally valid despite this treatment. In the latter cases, the entrepreneur has non-firm income which is sufficient to insure that he always pays some tax, even with maximal firm-related losses; hence, $(\tau-\gamma)$ can be interpreted as the entrepreneur's tax rate on income ranging between his minimal and maximal levels, a rate which may well be constant.

[6]If the entrepreneur invests any of his own funds in the new project, BV will also include the amount of this additional investment and "I" will then represent the required external financing.

[7]Both types of organizations will be subject to the same incentive and information problems. Moreover, the possibility of corporate partners invalidates portfolio diversification arguments for incorporation as a C-type firm. However, liquidity problems associated with partnership shares (i.e., differential transactions costs) may give some incentive for a C-corporate form.

[8]Since the inequality versions of constraints (i) and (ii) will always bind at an optimum, the constraints are stated here in equality form.

[9] In keeping with a two-date problem, the construction in Appendix A implies that current period tax losses cannot be carried forward and offset against future income. However, these future offset possibilities can be roughly captured in the measure ED, which is defined and discussed below.

[10] ED_2 can also be interpreted to include a measure of the entrepreneur's greater ability (vis-a-vis other investors) to use tax losses against future income. For example, when a firm effectively goes bankrupt, the entrepreneur may be able to funnel future income through a shell of the former firm and thereby exploit the tax shields.

[11] Note that when D = CR = 0, tax loss limits are irrelevant and the analysis here is general.

APPENDIX A

Derivation of Taxable Profit/Loss

Four cases must be distinguished in deriving equation (3):

Case 1: $TP < 0$, $TC < 0$. In this case,

$$TP^* = 0 = \max(TP+TC,0)$$

Case 2: $TP > 0$, $TC < 0$. In this case,

$$TP^* = \max(TP+TC,0)$$

Case 3: $TP < 0$, $TC > 0$. Here, there are two subcases:

(i) $TP^* = TP \quad \text{if } TP+TC > 0$

(ii) $TP^* = -TC \quad \text{if } TP+TC < 0$

Case 4: $TP > 0$, $TC > 0$. In this case,

$$TP^* = TP = \max(TP+TC,0) - TC$$

Equation (3) captures all four cases. Note that TP* is constructed so that $(\tau-\gamma)TP^*$ represents tax cash flows for the entrepreneur.

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Figure 1

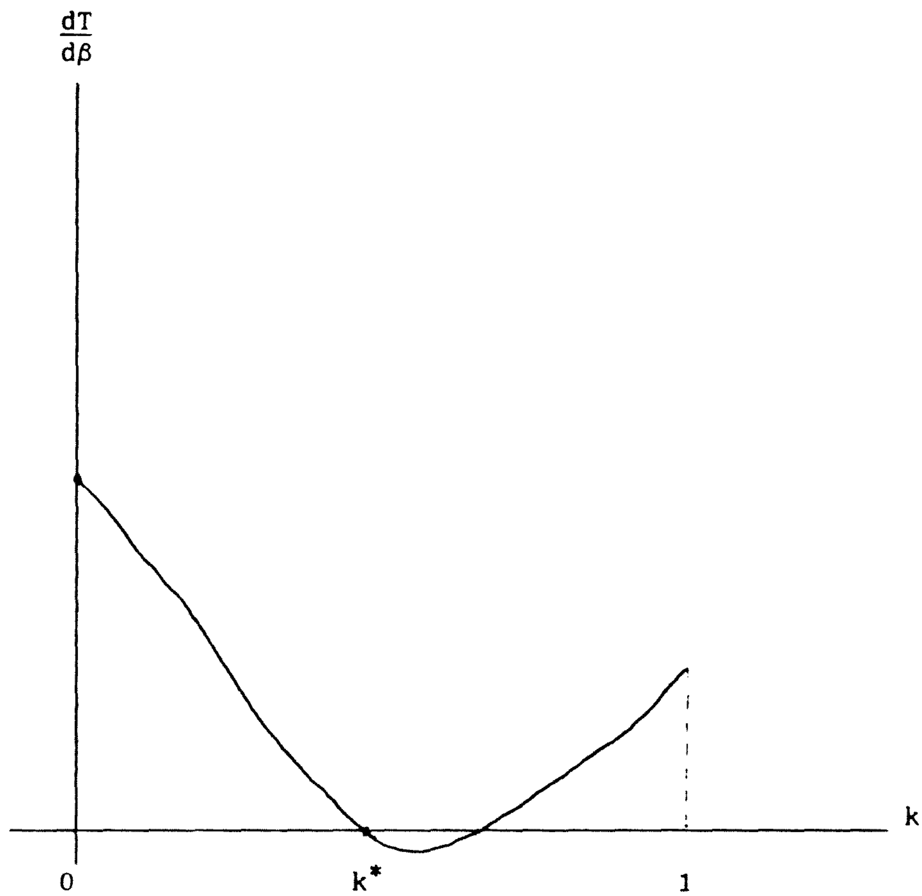
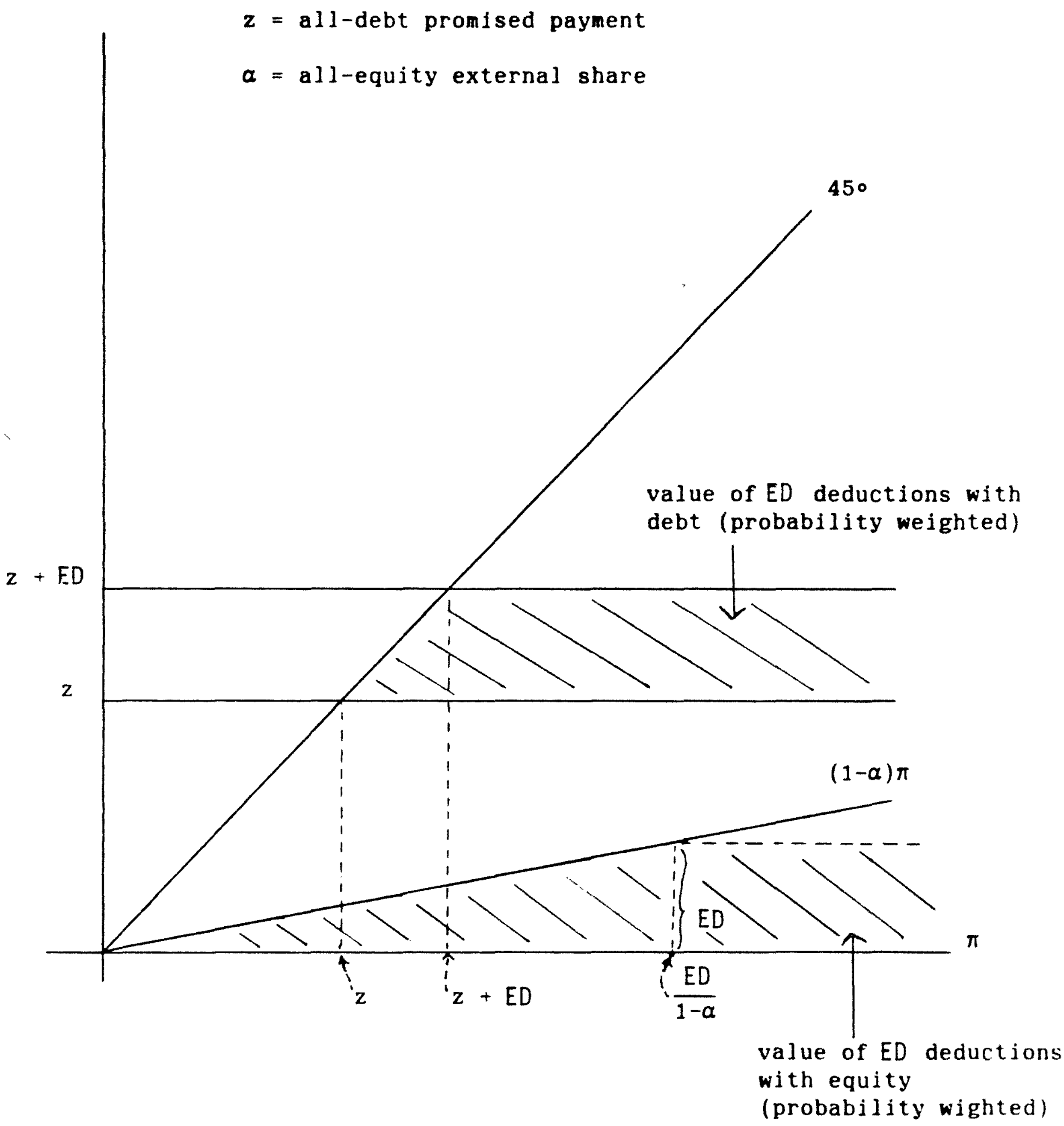


Figure 2


z = all-debt promised payment
α = all-equity external share
45°
value of ED deductions with debt (probability weighted)
z + ED
z
(1-α)π
ED
π
z
z + ED
ED/1-α
value of ED deductions with equity (probability wighted)